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(54) Tubular supporting structure

(57) A tubular cap-like retainer 20 fits within a supporting structure 10 and has a side wall 22 with a pair of slits 23 formed in a parallel manner to define a flexible arm 24. Both ends of the arm 23 are attached to the retainer 20. A locking projection 25 formed on the inner face of the arm engages a cavity member 11 within the structure 10 thus urging the arm against the inner surface of the structure 10 with a strong retention force.

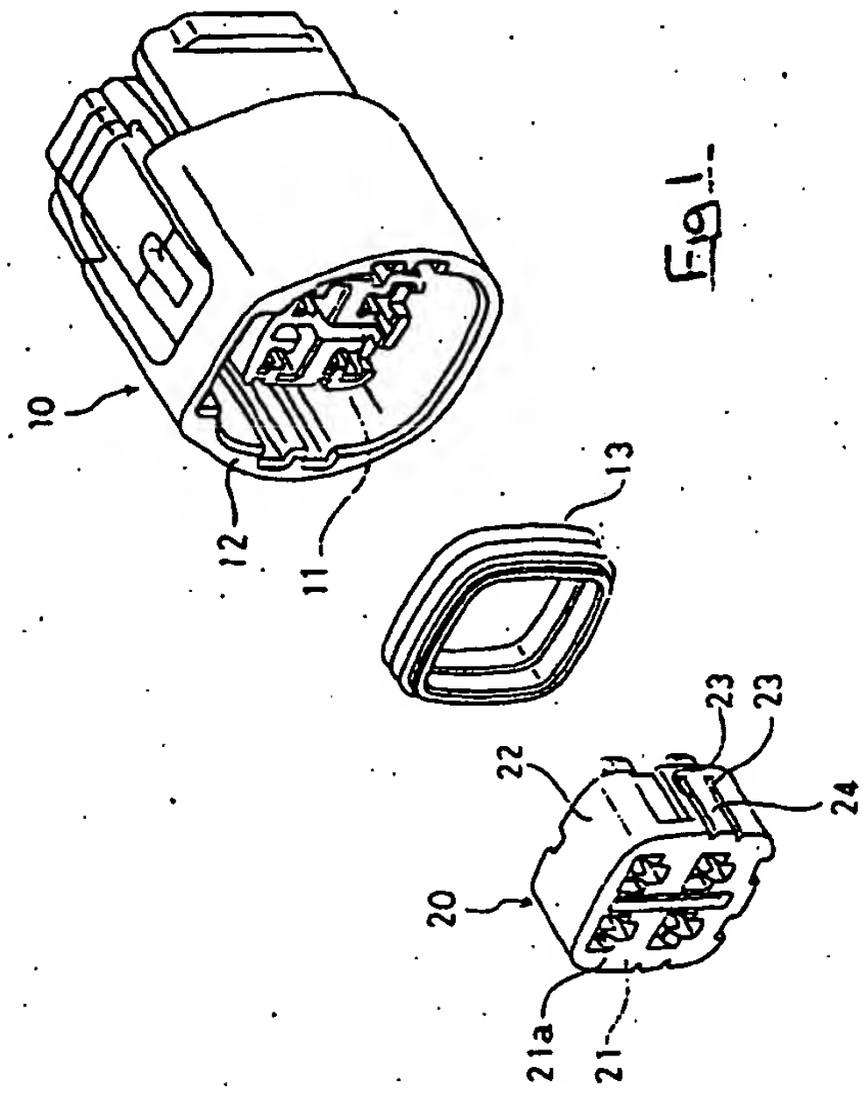

Fig.1

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Description

FIELD OF INDUSTRIAL APPLICATION

The present invention relates to a tubular supporting structure, and particularly to such a structure for an electrical connector.

PRIOR ART

As shown in accompanying Figures 3a-3c, a conventional retainer for a water-proof electrical connector is well-known as a tubular supporting structure. A cap-like retainer 1 is covered by the outer part of a housing 10 having terminal fitting insertion chambers 7, and doubly stops terminal fittings housed in the terminal fitting insertion chambers. The retainer 1 has an outer end wall 2 that faces out of the housing, and a surrounding side wall 3. Pairs of slits 4 are formed in a parallel manner on the side wall 3 as illustrated. The slits 4 extend from the inner side towards the outer side. Arms 5 are formed between the slits 4 and each has a free end. On the inner face of the arm 5 is formed a projection 6 that extends inwardly. A seal 13 is provided inboard of the retainer.

When the retainer 1 is pushed into a housing (Fig. 3c), the projections 6 formed on the inner side faces of the arms 5 make contact with an inner part of the housing. As a result, the arms 5 are resiliently bent outwardly until the cap 1 is at a specified depth where the projections 6 fit with corresponding recesses 9 of the housing (Fig.3b). In this condition the arms 5 are loaded so that the cap 1 is supported in the housing.

In the conventional tubular supporting structure described above, the supporting force is weak since the arms 5 have free ends.

The present invention has been developed after taking this problem into consideration, and aims at presenting a tubular supporting structure that can strengthen the supporting force and that can also make it robust.

SUMMARY OF THE INVENTION

According to the invention there is provided a tubular retainer and a support structure in combination, the retainer fitting with the support structure along a fitting axis, having a protruding wall and in the wall a flexible arm defined by spaced slits, the arm having a projection perpendicular to said axis and adapted for engagement with said support structure in use, wherein said flexible arm is secured at both ends thereof to said wall.

Since the arm is formed so as to be supported at both ends between the slits it is much stronger than the prior art construction. The arm is stiffer and the supporting force is thus increased. The arm is also less susceptible to damage since a free end is not provided.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features of the invention will be apparent from the following description of a preferred embodiment shown by way of example only in the accompanying drawings in which:

FIGURE 1 is an exploded isometric view of a water-proof connector using a tubular supporting structure according to an embodiment of the present invention.

FIGURE 2a is an enlarged isometric view of the essential part of the invention;

FIGURE 2b is a partial section through a connector and showing one embodiment of the invention in the fully engaged state;

FIGURE 2c corresponds to Fig.2b and illustrates a partially engaged state;

FIGURE 3a is an exploded isometric view of a prior art water-proof connector;

FIGURE 3b corresponds to Fig.2a and shows a prior art arrangement; and

FIGURE 3c corresponds to Fig.2c and shows a prior art arrangement.

DESCRIPTION OF PREFERRED EMBODIMENT

With reference to Figs.1 and 2a, a water-proof connector housing 10 comprises a substantial tubular cavity member 11 having terminal fitting insertion chambers which allow terminal fittings to be housed therein, and a tubular hood member 12 that covers this cavity member 11. The cavity member 11 and the hood member 12 are connected towards the inner end so as to define a peripheral clearance around the cavity member, and an annular rubber seal 13 is attachable to the exterior side face of the inner extremity of the cavity member 11.

A cap-like retainer 20 is arranged to be able to cover the extreme end of the cavity member 11. On an outer face 21 are formed a plurality of through holes 21a which correspond to each of the terminal fitting insertion chambers of the cavity member 11. Further, a tubular side wall 22 is formed that extends from the edges of the outer face 21 towards the inner side. The outer end of the cavity member 11 is insertable within the side wall 22.

As shown in the enlarged view of Fig.2, the side wall 22 has slits 23 formed therein that extend towards the inner end. The slits 23 are formed in pairs on the side wall 22 and their extreme inner ends are closed. An arm 24 is formed between the slits 23 and which is fixed at both ends to the side face wall 22. A locking projection 25 is formed on the inner face of the arm 24 and which projects towards the cavity member 11 in use. Furthermore, on the side face of the cavity member 11 is formed an aperture 26 corresponding to the locking projection 25.

Since the arm 24 is supported from both sides, only the central portion can bend inwards and outwards. As a result, compared to the conventional case where one extremity is free, a firm arm is achieved. Moreover, the

rigidity of the arm 24 can be altered by changing the thickness and width of the arm 24.

In the present embodiment, the retainer 20 has an outer wall 21 and is cap-like. However, it need not necessarily be cap-like as long as the arm 24, which can bend inwards and outwards, is formed on the side wall 22 for engagement with the cavity member 11.

Figures 2b and 2c illustrate engagement of a retainer on a cavity member 11. Fig.2b shows the fully engaged condition, the linking portion at the free end of arm 24 being indicated by dotted line 27. Fig.2c illustrates how the mid portion of the arm 24 is urged outwardly as the retainer is engaged, and demonstrates that the engagement force is increased due to the increased stiffness.

The operation of the present embodiment, configured as described above, is explained.

Terminal fittings are inserted into the terminal fitting insertion chambers of the cavity member 11, and the rubber seal 13 is fitted in the outer portion. The retainer 20 is inserted into the hood member 12, and the cavity member 11 makes contact with the locking projection 25 located on the inner side of the arm 24. Accordingly, the outer side of the cavity member 11 tries to push out the arm 24 via the locking projection 25.

As described above, since the arm 24 is supported from both ends, only the central portion tends to extend outwards (Fig.2c), the locking projection 25 being continuously pushed from the inside with a strong force. Furthermore, when the retainer 20 is pushed in, the locking projection 25 fits into the aperture 26 and the retainer 20 comes to a halt.

In this position, the arm 24 pushes the locking projection 25 towards the opening 26 with a strong force, and the supporting force is accordingly increased compared with the prior art. Moreover, since the arm 24 is supported from both ends, there is no possibility of damage as can happen in the case where one end is free, such damage occurring due to some object striking the free end, and possibly breaking off the arm. Strengthening is thereby effected.

Although the invention has been described with the locking projection directed inwardly, it might also be directed outwardly for engagement of a retainer within a corresponding structure. What is important is that the locking arm is supported at both ends to increase the stiffness thereof, and project the arm from inadvertent damage.

Claims

1. A tubular retainer 20 and a support structure 10 in combination, the retainer 20 fitting with the support structure 10 along a fitting axis, having a protruding wall 22 and in the wall 22 a flexible arm 24 defined by spaced slits 23, the arm 24 having a projection 25 extending perpendicular to said axis and adapted for engagement with said support structure 10 in use, wherein said flexible arm 24 is secured at both ends thereof to said wall 22.

2. The combination of claim 1 wherein the retainer 20 fits within the support structure 10.

3. The combination of claim 2 wherein the projection 25 is directed inwardly of the retainer 20.

4. The combination of any preceding claim wherein said flexible arm 24 has parallel sides.

5. The combination of any preceding claim wherein said projection 25 is at the middle of said arm 24.

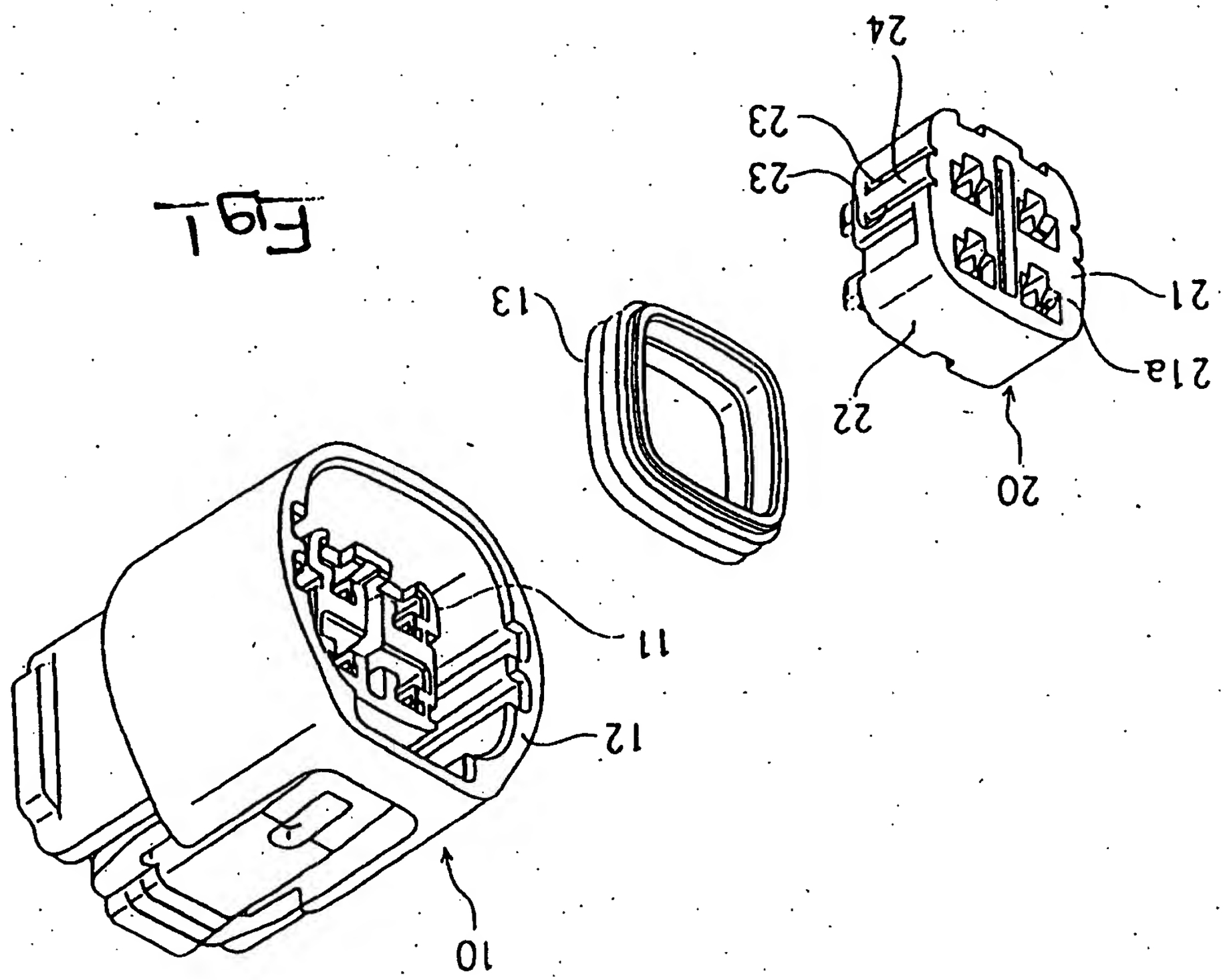
6. The combination of any preceding claim wherein the long axis of said flexible arm 24 is parallel to said fitting axis.

7. The combination of any preceding claim wherein opposite flexible arms 24 are provided on said retainer.

8. The combination of any preceding claim wherein said retainer 20 is substantially rectangular and said wall 22 is of substantially constant thickness, the end faces of the retainer 20 being planar and the adjacent edges of the side walls being radiused, and the support structure 10 is of complementary shape.

9. The combination of any preceding claim wherein said retainer 20 is a one piece plastics moulding.

Fig.1



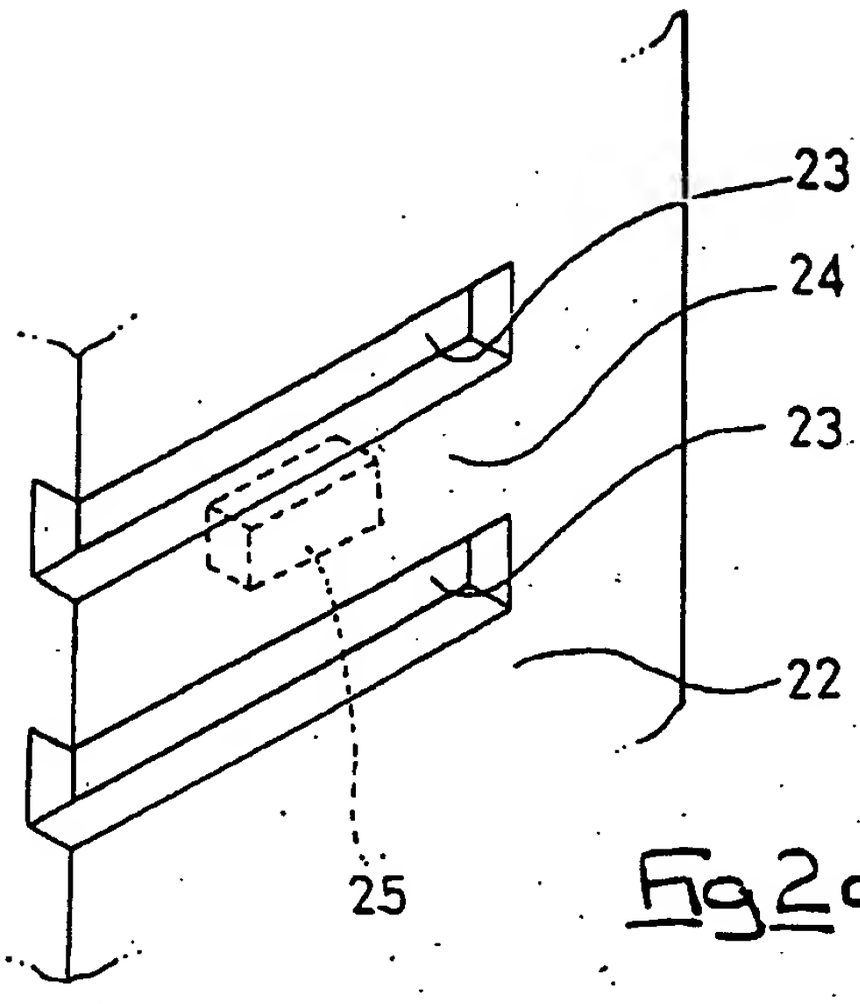


Fig 2a

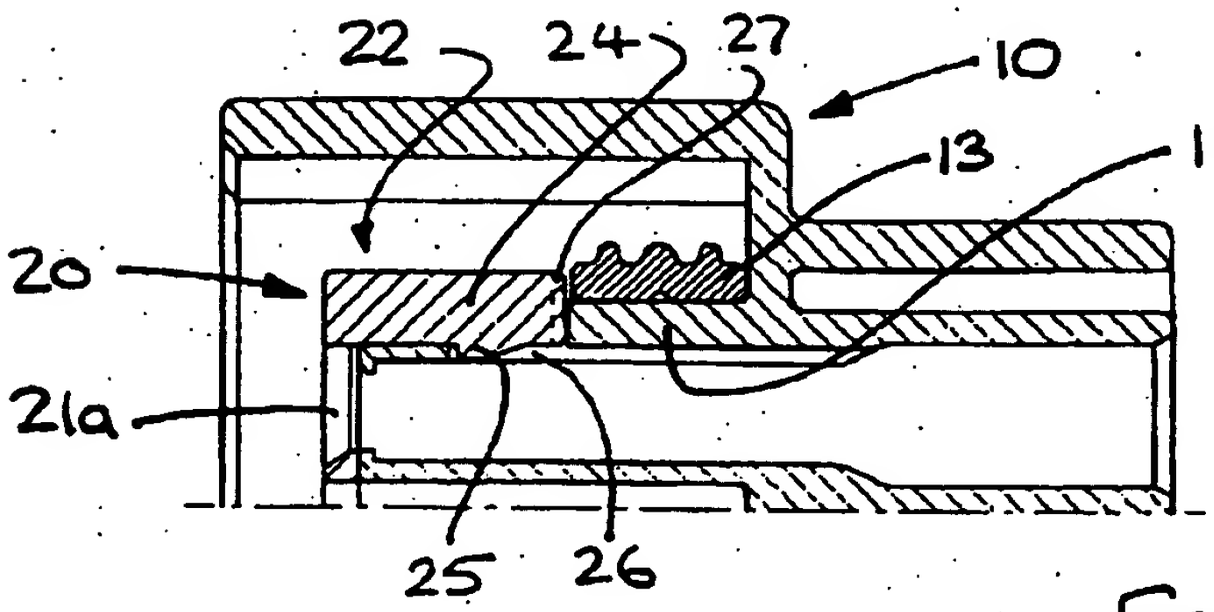
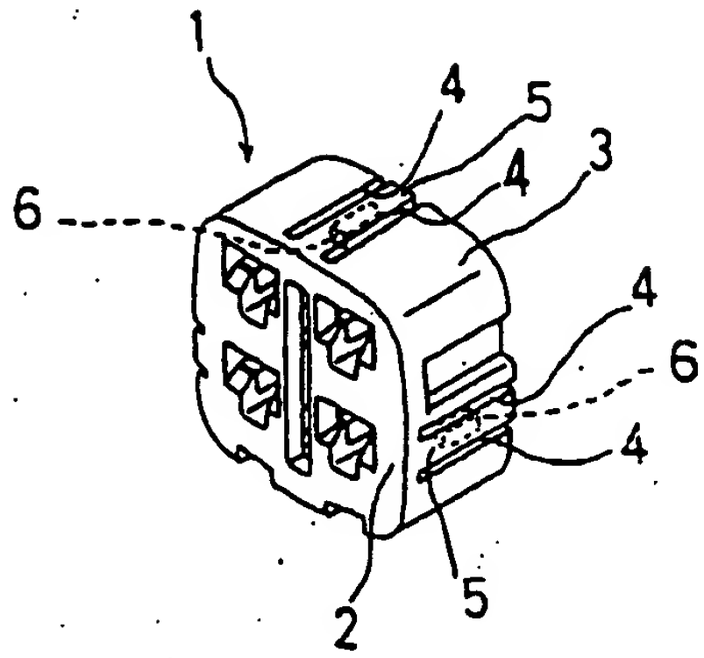


Fig 2b

Fig 2c



PRIOR ART

Fig 3

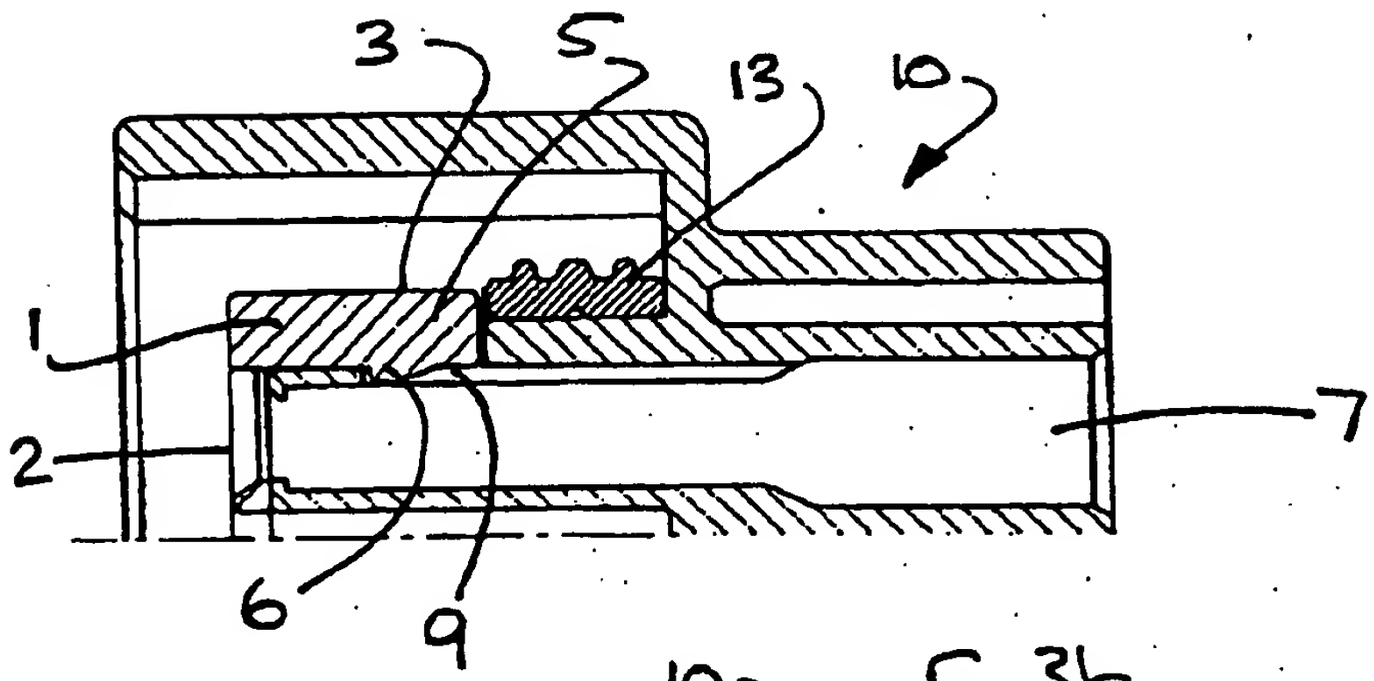


Fig 3b

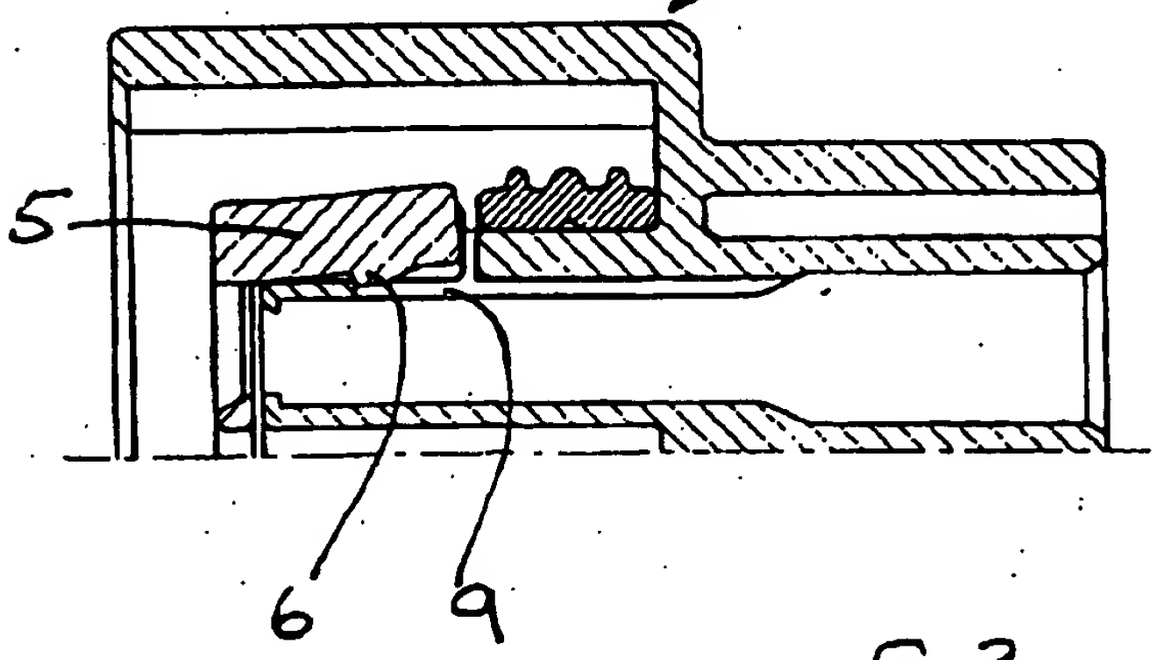


Fig 3c